

## **ENGINEERING EVALUATION/COST ANALYSIS DEPOSITIONAL AREA**

### **Talache Mine Tailings Site Atlanta, Idaho**

#### **EXECUTIVE SUMMARY**

This Engineering Evaluation/Cost Analysis (EE/CA) for the Depositional Area of the Talache Mine Tailings Site ("Site") was prepared in response to the December 30, 1999 Statement of Work (SOW) attached to the February 1999 Administrative Order on Consent (AOC) for Removal Action. Work and investigations have been ongoing at the Site under several preceding administrative orders. This document presents technical information and design concepts for removal action alternatives for the Depositional Area of the Site, which is located near the community of Atlanta in Elmore County, Idaho. The Tailings Piles are situated in the Montezuma Creek drainage at an elevation of approximately 5,700 feet above sea level. The Depositional Area is located northwest of the Tailings Piles, encompasses approximately 60 acres, and extends to the Middle Fork Boise River (MFBR). Montezuma Creek flows to the northwest, adjacent to the Tailings Piles, and enters the MFBR approximately one mile below the Tailings Piles.

On May 15, 1997, the Upper Tailings Pile was breached causing a release of tailings downhill to the northwest, across the Lower Tailings Pile, and thence downslope within the Montezuma Creek valley. This event is hereinafter referenced as the "1997 release." The area below the Lower Tailings Pile where tailings were deposited as a result of the 1997 release is known as the "Depositional Area." Together, the Tailings Piles and the Depositional Area comprise the Site. Approximately 16,000 cubic yards of tailings were mobilized to the Depositional Area during the 1997 release, which appears to be related to excessive water accumulation on the Upper Tailings Pile surface. Approximately 15,000 cubic yards of tailings and affected soil have been removed from the Depositional Area and placed on the Lower Tailings Pile during response actions in 1997 and 1998. As these tailings and soil were removed, evidence of older, buried tailings layers was discovered. These older tailings appear to be related to an earlier breach in the Tailings Piles area, though definitive information is not available. Additional work completed after the 1997 release included the installation of silt fences and sediment barriers, and the construction of surface water controls and sedimentation ponds.

Extensive characterization activities have been taken at the Site since the 1997 release. These activities have provided the necessary information to characterize Site surface water, groundwater, soil, sediment, and air to the extent required to support the selection of appropriate removal actions within the EE/CA context. Separate EE/CA activities address the Tailings Piles and the Depositional Area. This report presents the EE/CA for the Depositional Area. The Tailings Piles EE/CA was completed in May 1999, related design activities were completed in April 2000, and construction commenced in July 2000.

Baseline human health and ecological risk assessments were conducted for the Depositional Area. These studies identified risks at the Site to human and environmental receptors. Those risks are primarily associated with locally elevated levels of arsenic in Depositional Area soil. As such, arsenic concentrations in soil, and their effects on humans, comprise the clean up driver for the Depositional Area. Based on the risk assessments, U.S. EPA established Preliminary Removal Action Objectives (PRAOs) and Preliminary Removal Goals (PRGs). The PRAOs identified for the Depositional Area are (URS Greiner Woodward Clyde, 2000):

Protect recreational users (primarily children) from direct contact and incidental ingestion of surface soil and tailings material from the Depositional Area containing arsenic in excess of

the PRG and a hazard index of 1.

Prevent exposure to hypothetical future residents (adults/children) in the upland portions of the Depositional Area from direct contact with or incidental ingestion of surface soil containing arsenic in excess of the PRG and the target goal risk range of  $10^{-4}$  to  $10^{-6}$ .

Prevent exposure to hypothetical future residents (adults/children) in the upland portions of the Depositional Area from direct contact with or incidental ingestion of surface soil containing arsenic in excess of the PRG and a hazard index of 1.

The point of compliance, which is the physical location at which a PRG should be attained in a medium, is defined as the surface soil/tailings at the Depositional Area. PRGs established for the Depositional Area are (URS Greiner Woodward Clyde, 2000):

360 mg/kg arsenic in soil for recreational exposure to current area residents, based on noncancer hazard to a child engaged in recreational activities at the Depositional Area; and

36 mg/kg arsenic in soil for residential exposure to hypothetical future residents in upland portions of the Depositional Area, based on noncancer hazard to a child. It should be noted that the residential PRG is based on measured arsenic concentrations in areas that were not affected by the 1997 release (i.e., “background” concentrations).

Each PRG represents the 95 percent upper confidence level (UCL) of the Site mean arsenic concentration in soil. In addition to meeting the PRAOs (through attainment of associated PRGs), viable removal action alternatives must also comply with applicable and/or relevant and appropriate requirements (ARARs). An ARARs analysis was implemented to establish requirements that would pertain to the Tailings Piles removal action.

### **Description of Alternatives**

A suite of five removal action alternatives were developed to address the Depositional Area. General descriptions of these alternatives are provided below. Detailed discussions are presented in Section 6 of this report.

#### *Alternative 1: No Action*

Alternative 1 is the no-action alternative. In this case, no further activity nor monitoring would occur at the site, the Depositional Area would remain in its current condition, and surficial arsenic concentrations in soil would remain unmitigated. The in-place controls on stormwater runoff would eventually fail. Vegetative cover would increase with time, though the rate of such increase would likely be slow.

#### *Alternative 2: Selective Covering to Achieve the Recreational PRG with Institutional Controls (ICs) for Residential Land Use*

Alternative 2 consists of: (1) application of a 6-inch thick soil cover on selected areas primarily within the Depositional Area uplands to achieve the recreational PRG as defined by the 95 percent upper confidence level (UCL) of the mean arsenic concentration within the entire Depositional Area, (2) vegetation

of the cover soil, (3) additional vegetation in existing areas of poor vegetation, (3) streambank stabilization in areas affected by previous removal activities, and (4) application of institutional controls to protect human health under a future residential land use scenario. The institutional controls also would be developed to appropriately limit domestic groundwater use, in the event that the arsenic Maximum Contaminant Level (MCL) is reduced by U.S. EPA, resulting in future exceedances of this MCL within the Depositional Area.

This alternative would not result in the removal of tailings from the Depositional Area. The soil cover would be of a 6-inch thickness, consistent with continued recreational land use (i.e., such use typically would not result in penetration of more than 6 inches through a soil cover) and the covered area would be graded to eliminate depressions and to promote runoff. Attainment of the recreational PRG, and protection of human health under future residential land use, would result in full attainment of the PRAOs so long as the cover remains intact. Based on reasonable estimates of the rates at which borrow material could be processed and spread over the target areas, this removal action alternative could be completed in about 2 months.

#### *Alternative 3: Selective Excavation/Backfilling to Achieve the Recreational PRG with ICs for Residential Land Use*

Alternative 3 consists of excavation of selected areas primarily within the Depositional Area and small areas of adjacent wetlands. Backfilling would be implemented in excavated areas where residual arsenic concentrations exceed the recreational PRG. The excavation would target tailings that remain in the Depositional Area from the 1997 release, to the extent feasible; older tailings layers would remain. The 1997 tailings would be initially identified based on soil horizons that typically separate the 1997 tailings from the older tailings. Areas requiring backfill would be based on whether residual arsenic concentrations in soil are above the PRG after excavation, as identified in the field using portable X-ray fluorescence (XRF) equipment. The thickness of the backfill would be 6 inches, consistent with recreational land use (i.e., such use typically would not result in penetration of more than 6 inches through a soil cover). The result of these activities would be achievement of the recreational PRG, as defined by 95 percent UCL of the mean arsenic concentration, within the entire Depositional Area.

Alternative 3 would also include: (1) vegetation of areas affected by the removal action, (2) additional vegetation in existing areas of poor vegetation, (3) streambank stabilization in areas affected by previous removal activities, and (4) application of institutional controls to protect human health under a future residential land use scenario. The institutional controls also would be developed to appropriately limit domestic groundwater use, in the event that the arsenic MCL is reduced by U.S. EPA, resulting in future exceedances of this MCL within the Depositional Area. Excavated soil would be disposed and covered at the Lower Tailings Pile. Excavations and backfilled areas would be graded to eliminate depressions and promote runoff. Therefore, under this alternative, soil with arsenic concentrations that exceed the recreational PRG would either be removed from the Depositional Area or backfill would be emplaced over such soil, to prevent human exposure so long as the backfill layer remains intact. Based on reasonable estimates of the rates at which the tailings could be excavated and borrow material and spread over the target areas, this response action alternative could be completed in about 2.5 months.

#### *Alternative 4: Excavation/Covering to Achieve the Residential PRG*

Alternative 4 would result in attainment of the residential PRG in the upland portion of the Depositional Area and attainment of the recreational PRG in the wetlands portion of the Depositional Area. This alternative consists of excavation of the Depositional Area uplands and portions of the adjacent wetlands followed by select backfill over portions of the excavated areas. Backfilling would be

implemented in excavated areas where residual arsenic concentrations in soil exceed the residential or recreational PRG. The excavation would target tailings that remain in the Depositional Area from the 1997 release, to the extent feasible; older tailings layers would remain. The 1997 tailings would be identified, in the field, based on soil horizons that typically separate the 1997 tailings from the older tailings. Areas requiring backfill because residual arsenic concentrations in soil exceed the PRGs would be identified in the field using portable XRF equipment. The soil used for such backfilling will meet the PRGs. The thickness of the backfill in the residential areas would be 12 inches, consistent with residential land use (i.e., such use typically includes digging associated with landscaping and home improvement that would penetrate a thinner backfill). The thickness of the backfill in wetlands areas would be 6 inches, consistent with recreational land use. The result of these activities would be achievement of the residential PRG within the uplands portion of the Depositional Area and achievement of the recreational PRG in the wetlands portion of the Depositional Area, based on the 95 percent UCL arsenic concentration in each area. Statistical evaluation of the arsenic concentration data in soil indicates that achievement of the residential PRG in the uplands area will also result in achievement of the recreational PRG in the wetlands portion of the Depositional Area. This is appropriate because residential development in the wetlands is highly unlikely.

Alternative 4 would also include: (1) vegetation of areas affected by construction, (2) additional vegetation in existing areas with poor vegetation, (3) streambank stabilization in areas affected by previous removal activities, and (4) application of institutional controls to protect human health under a future residential land use scenario. In particular, institutional controls invoked under Alternative 4 would need to address the subsurface soil that may be exposed through activities such as installation of utilities and construction of basements. The institutional controls also would be developed to appropriately limit domestic groundwater use, in the event that the arsenic MCL is reduced by U.S. EPA, resulting in future exceedances of this MCL within the Depositional Area. Excavated soil would be disposed and covered at the Lower Tailings Pile. Excavation and backfilling would be graded to eliminate depressions and promote runoff.

#### *Alternative 5: Excavation/Backfilling to Background Concentrations*

Alternative 5 involves removal of all tailings from the entire Depositional Area (both wetlands and uplands areas), including tailings from the 1997 release as well as buried tailings layers associated with older releases. Such removal would be expected to result in achievement of the residential PRG, which is equivalent to the background arsenic concentration, as defined by the 95 percent UCL of the mean arsenic concentration within the entire Depositional Area. Therefore, under this alternative, soil with arsenic concentrations in the entire Depositional Area that exceed the residential PRG would be removed and backfilling would not be needed specifically to achieve the target PRG. Instead, backfilling would be implemented to restore the form and character of the wetlands as well as to promote positive drainage and elimination of depressions in the uplands area. The thickness of the backfill would therefore be variable according to the final grading plan for the site. The excavated area would be revegetated using wetland, riparian, and upland plant species, where appropriate, and the channels of Montezuma and Unnamed Creeks would be re-established.

The volume of soil that would be excavated under Alternative 5 would exceed the capacity of the nearby Tailings Piles closure, necessitating the identification of an additional repository site. Similarly, the volume of backfill that may be needed would likely exceed that of the colluvial borrow source currently identified for the Tailings Piles closure, necessitating the identification of an additional borrow source. This alternative would require destruction of the sensitive wetland habitat in the Depositional Area, and thus corresponding care would be needed to ensure that the wetlands are properly restored. In addition, construction in the wetland area would necessitate significant clearing/grubbing and dewatering efforts. Based on reasonable estimates of the rates at which the tailings could be excavated and borrow material and spread over the target areas, this response action alternative could be completed in about 9 months (264

days).

## **Evaluation of Alternatives**

The five removal action alternatives were evaluated individually with respect to effectiveness, implementability, and cost (the “detailed analysis”). Effectiveness is assessed based on the components of: (1) overall protectiveness of human health and the environment; (2) short-term effectiveness; (3) long-term effectiveness; (4) reduction of toxicity, mobility, or volume; and (5) compliance with ARARs. Implementability is assessed based on the components of: (1) technical feasibility, (2) availability of services and materials, and (3) administrative feasibility. Costs comprise estimated capital costs, operation and maintenance costs, and present worth costs. The present worth of operation and maintenance costs were calculated for a 30-year period. Brief descriptions of the detailed analysis for each alternative are presented in the following paragraphs. Table 7-1 summarizes the detailed analysis for each alternative.

### *Alternative 1*

The no-action alternative was retained for comparison purposes, pursuant to the National Contingency Plan. The short- and long-term effectiveness of this alternative is low. Alternative 1 would not be effective because it would not achieve the preliminary removal action objectives and thus is not protective of human health or the environment. In addition, Alternative 1 would not provide long-term effectiveness because the current of tailings erosion by water and wind would continue. Finally, Alternative 1 does not comply with ARARs. Alternative 1 is technically feasible to implement and would not be dependent on the availability of services and materials. No monitoring nor operations and maintenance (O&M) would be implemented under Alternative 1, therefore there are no costs associated with this alternative.

### *Alternative 2*

This alternative focuses on covering areas with the highest arsenic concentrations, with minimal tailings relocation and handling. Alternative 2 would provide a high degree of effectiveness and would achieve preliminary removal action objectives and ARARs for recreational land use, but not residential land use. In particular, the short-term effectiveness of Alternative 2 would be high because tailings would not have to be excavated, handled, nor relocated. The long-term effectiveness would depend on an O&M plan ensuring the integrity of the soil cover. The minimal amount of material handling also would result in relatively rapid implementation of Alternative 2. The capital costs for this alternative are estimated to be \$867,000. The total present worth of Alternative 2, including O&M, is estimated to be \$1,089,000.

### *Alternative 3*

This alternative focuses on select excavation and removal of soil areas with the highest arsenic concentrations and backfilling areas that exceed the recreational PRG for arsenic. Alternative 3 would provide a high degree of effectiveness and would achieve preliminary removal action objectives and ARARs for recreational land use, but not residential land use. The short-term effectiveness of Alternative 3 would be moderate to high because a relatively small volume of tailings would be excavated, handled, and relocated. The small amount of material handling also would result in relatively rapid implementation of Alternative 3. The capital costs for this alternative are estimated to be \$635,000. The total present worth

of Alternative 3, including O&M, is estimated to be \$789,000.

#### *Alternative 4*

This alternative focuses on excavation of all tailings in the upland area from the 1997 release with backfilling in areas where the arsenic concentration still exceeds the residential PRG, and removal/backfilling in the wetlands area to achieve the recreational PRG. Alternative 4 would provide a high degree of effectiveness and would achieve all preliminary removal action objectives and ARARs. The short-term effectiveness of Alternative 4 would be high because the alternative could be implemented in a single construction season, though the volume of tailings that would be excavated, handled, and relocated would be greater than for Alternative 3. The amount of material handling also would result in a moderate duration for Alternative 4. The capital costs for this alternative are estimated to be \$1,708,000. The total present worth of Alternative 4, including O&M, is estimated to be \$2,134,000.

#### *Alternative 5*

This alternative focuses on removal of all tailings from the Depositional Area such that remaining soil meets the estimated background concentration (residential PRG). Due to the size and scope of Alternative 5, it would require construction of a new and separate disposal site for relocation of soils removed from the Depositional Area, as well as the development of a new borrow area. Alternative 5 would provide a high degree of effectiveness and would achieve all preliminary removal action objectives and ARARs. The short-term effectiveness of Alternative 5 would be low due to the large volume of tailings that would be excavated, handled, and relocated. The amount of material handling also would result in a relatively lengthy duration estimated to be at least two full construction seasons for Alternative 5. The capital costs for this alternative are estimated to be \$7,203,000. The total present worth of Alternative 5, including O&M, is estimated to be \$9,001,000.

Alternatives 1-5 were evaluated relative to one another, again based on the criteria of effectiveness, implementability, and cost (the “comparative analysis”). The results of the comparative analysis are summarized in Table 7-1. Alternative 1, the no-action alternative, provides a low level of effectiveness and does not comply with preliminary removal action objectives nor ARARs. Alternatives 2-5 each were assessed to have an overall high level of effectiveness.

One aspect of effectiveness in which Alternatives 2-5 differed is short-term effectiveness. Alternatives 2, 3, and 4 are evaluated to have a high level of short term effectiveness because they can be implemented in a single construction season, though Alternative 2 would require no handling of tailings and Alternatives 3, 4, and 5 would require the handling and relocation of successively larger amounts of tailings.

All alternatives are assessed to have a high overall degree of implementability with the exception of Alternative 1 (no-action), which would not be implementable based on administrative feasibility.

#### *The Preferred Alternative*

[Note: See EPA Fact Sheet, dated May 2001, for description of EPA’s preferred alternative.]

Alternative 3 is selected as the preferred alternative. Alternative 3 would reduce site risks and achieve the PRAOs by tailings excavation and removal at areas with the known highest levels of arsenic, by backfilling areas with residual elevated arsenic levels, by seeding areas disturbed by the removal action and

existing areas of poor vegetation, and by stabilizing streambank areas disturbed by previous removal actions.

Alternative 1 would not meet the PRAOs. Although Alternatives 2 and 3 are assessed to be similar in scope and volume of materials handling, Alternative 3 is preferred over Alternative 2 because soils with the highest arsenic concentrations would be removed from the Depositional Area and would be disposed of at the Tailings Piles. The Depositional Area arsenic concentration in surface soil after Alternative 3 is completed would meet the recreational PRG. In addition, Alternative 3 could be completed within a single construction season. ICs would ensure that future residential land use (including use of groundwater) occurs in a manner that is protective of human health. Finally, Alternative 3 is estimated to result in lower overall cost than Alternative 2.